Attaining and Enacting Green Leadership: Insights from the Green IT Initiatives of China Mobile

Completed Research Paper

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Abstract

For Green Information Technology (IT) initiatives to have a significant and lasting impact on the environment, they cannot be implemented in isolation. Instead, there is a need for collective action among diverse stakeholders operating in inter-organizational business networks, which in turn, demands an appropriate leadership structure. Yet, the notion of 'Green Leadership' has never been explored. Using a case study of the green IT initiatives of China Mobile, the largest mobile telecommunications provider in the world, this study seeks to shed light on the underlying process through which green leadership can be achieved and subsequently enacted to facilitate collective green IT initiatives. With its findings, this study presents an empirically supported process model that complements the dominant internal-oriented perspective of green IT, and provides practitioners with a useful reference for leveraging the collective resources and capabilities of their business network to contribute towards preserving the environment for future generations.

Keywords: Green IT, environmental sustainability, collective action, case study

Introduction

For over 20 years, environmental sustainability, defined as *"stakeholder behavior impacting on the natural environment that meets the needs of the present without compromising the ability of future stakeholders to meet their own needs"* (Elliott 2011, p. 207), has been identified by the United Nations as one of the foremost concerns of contemporary society (Brundtland Commission 1987). As the natural environment continues to deteriorate, as evidenced, for example, by the increasing concentration of greenhouse gases and the depletion of natural resources (e.g. National Intelligence Council 2008; Stern 2007), the pressure on business enterprises is mounting (Melville 2010). Consequently, many businesses today have initiatives related to environmental sustainability incorporated in their organizational strategy (Esty and Winston 2006). Taking their cue from these developments, Information Technology (IT) practitioners have named *'Green IT'* as one of the most important strategic technologies for three consecutive years (Gartner Group 2007, 2008, 2009). Simply put, Green IT is the application of computing resources towards environmental sustainability (Murugesan 2008). A recent estimate indicates that over 80% of all firms worldwide have already implemented or are in the midst of planning for green IT initiatives (Corbett 2010) and the market for green IT services is projected to hit US$4.8 billion within two years (Mines et al. 2009). Yet, although recognition of the potential of IT in facilitating environmental sustainability (e.g. Jenkin et al. 2011; Mithas et al. 2010) is growing in practice, there remain a number of gaps in the academic literature.

As will be elaborated on in our literature review, although the broader topic of environmental sustainability is a fairly well-researched area across a variety of academic disciplines (For a review, please refer to Elliott 2011), research in the area of green IT is only just emerging (Jenkin et al. 2011; Melville 2010). In addition, of the published works on green IT, most of them are conceptual in nature and not supported by empirical evidence (e.g. Corbett 2010; Dao et al. 2011). While gaps in the literature are certainly to be expected given the relative immaturity of the research area, collectively, these gaps indicate a lack of knowledge on how green IT initiatives can be effectively implemented. Without grasping the nature of this underlying process, it may be difficult, if not impossible to consistently unlock the potential of IT for enabling environmental sustainability.

More importantly, effective, far-reaching green IT initiatives tend to demand inter-organizational collaboration as collective action is *"necessary to ensure effective, efficient and equitable responses on the scale required"* (Elliott 2011, p. 208). Furthermore, the effectiveness of inter-organizational collaboration tends to be dependent on the influence of a core firm (Pierce 2009) that establishes and legitimates governance structures (Dyer and Singh 1998) and collaborative processes (Gray 1985). This implies that for green IT initiatives to have a real impact in tackling climate change (Elliott 2011), an organization with the ability to marshal the collective resources of its business partners must enact green leadership; defined as the mechanisms through which a dominant organization either influences or transforms follower organizations to achieve its environmental objectives (Huxham and Vangen 2000). Yet, to the best of our knowledge, of the handful of empirical studies on the implementation of green IT in the literature, all of them internal-oriented in that they are centered on the characteristics and actions of firms in isolation (e.g. Chen et al. 2009; Mithas et al. 2010). As such, we contend that there is a need for further research in this area; research that not only accounts for how green leadership can be attained, but enacted to mobilize the collective resources of business networks for high-impact green IT initiatives as well.

Using a case study of China Mobile, the world's largest mobile telecommunications provider and an organization noted for its green IT initiatives in China, the purpose of our study is to contribute to the existing knowledge by addressing the aforementioned gaps in a number of ways. Towards addressing the paucity of research and the lack of empirical validation in the existing green IT literature, the objective of our study is to derive specific propositions on effective green IT implementation that are grounded in the empirical reality of a real world organization. In addition, through an in-depth investigation of the underlying process through which green leadership can be achieved and subsequently enacted, our study will shed light on how the resources of contemporary organizations operating in the amorphous and fluid business networks that characterize the present network economy (Iansiti and Levien 2004) can be collectively channeled towards the overarching goal of environmental sustainability. Corresponding to the

purpose of our study, the research question that this study aims to answer is: How is green leadership achieved and enacted to facilitate collective green IT initiatives?

Literature Review: Green IT

In a reflection of the nascency of the research area, a myriad of terms and definitions have been used to describe the notion of green IT (Corbett 2010). Green IT is sometimes also referred to Information Systems (IS) for environmental sustainability (e.g. Melville 2010), environmental sustainability of IT (e.g. Elliott 2011) or green IS (e.g. Watson et al. 2010). Although some researchers have tried to draw the distinction between these terms (e.g. Watson et al. 2008), in keeping with the conventions of a significant number of prior works (e.g. Chen et al. 2009; Corbett 2010; Mithas et al. 2010, among others) and the practitioner vernacular (Gartner Group 2007, 2008, 2009), we will not distinguish between these terms and will adopt the most widely-used label of the concept (i.e. green IT) for the purpose of this paper. Taking an integrated perspective, we define green IT as an integrated and cooperating set of people, processes, and computing resources (Watson et al. 2010) that aim at pollution prevention, product stewardship or sustainable development (Chen et al. 2009; Molla et al. 2009a) for the purpose of enhancing environmental and economic performance (Melville 2010).

The impact of information technology (IT) on the environmental footprint of an organization is double-edged (Corbett 2010). On one hand, the use of IT tends to account for a significant portion of an organization's energy use, and the short life spans of IT products tend to create problems associated with their disposal (Jenkin et al. 2011). These characteristics, in tandem with macro-level trends such as the rapid growth of global computing and communications, as well as the proliferation of energy hungry data centers (Mithas et al. 2010), are expected to have an increasingly detrimental influence on the environment, with some estimates predicting an 80% increase in carbon emissions attributable to the use of IT within the next decade (Boccaletti et al. 2008). On the other hand, with its unique ability to monitor and maximize energy efficiency both within and outside the IT sector, green IT is projected to have the potential of reducing overall carbon emissions by 15% (The Climate Group 2008). The double-edged nature of IT, the moral imperative of environmental protection (Porter and Kramer 2006), as well as the growing demand for *"new data regarding environmental impacts, new information about causes and effects, and knowledge sharing about what works, what doesn't and why"* (Melville 2010, p. 2), makes research on the effective implementation of green IT initiatives important (Watson et al. 2010). Yet, despite its importance, a number of gaps remain in the literature.

First, although environmental sustainability is a fairly established topic with a history that spans decades in the areas of operations, marketing, economics and management, studies in the domain of IS has only just emerged in recent years (see Elliott 2011; Melville 2010). A number of independent reviews of the IS literature, for instance, found few or no studies on the topic of green IT prior to 2008 (e.g. Elliott and Binney 2008; Jenkin et al. 2011; Melville 2010), and the paucity of research on many aspects of green IT is an issue that is widely acknowledged in many of the studies that have emerged since (e.g. Bose and Luo 2011; Dao et al. 2011; Mithas et al. 2010, among others).

Second, of the emerging studies on green IT, most of them are conceptual in nature and not supported by empirical evidence (Dao et al. 2011). Consequently, while the discourse on energy informatics (Watson et al. 2010), the Believe-Action-Outcome framework (Melville 2010), organizational environmental orientation (Jenkin et al. 2011), and environmental ambidexterity (Thambusamy and Salam 2010) has been enriching and provides plenty of insights for IS scholars and practitioners, there were very few confirmatory studies that have empirically validated the propositions of these papers. Without empirical validation, future studies that build on these works can only remain in the realm of guesswork and assumptions, from which it is difficult to derive concrete theories and principles for the advancement of knowledge in this area.

Third, of the handful of empirical studies in the literature, all of them are internal-oriented and *"centered on a single firm"* (Dao et al. 2011, p. 67) when it is widely accepted that effective green IT initiatives demand collaboration and collective action among stakeholders within a business network (Corbett 2010; Elliott 2011). Moreover, the discourse on collaboration and collective action in the conceptual papers that are external-oriented has been largely limited to broad theoretical constructs such as *integrated initiatives* (Elliott 2011) and *supply chain management resources* (Dao et al. 2011) that can take on a

wide array of possible configurations and values. The sheer variety of possibilities embedded in the definition of these constructs strips them of the ability to generate meaningful and actionable indications for practice, without which the utility and interpretability of these prescriptions are limited. In addition, although effective collaboration and collective action demands leadership (Dyer and Singh 1998; Hargrave and van de Ven 2006), the notion of green leadership in the context of green IT implementation has never been explored. As such, there is a need for further research in this area so as to provide organizations operating in the ubiquitous business networks that characterizes the present networked economy (Iansiti and Levien 2004) with specific, actionable and relevant indications for effective green IT implementation.

Corresponding to these gaps, the purpose of our study is to shed light on how green IT initiatives can be effectively implemented (i.e. gap 1) through the attainment and enactment of green leadership (i.e. gap 3) at a real world organization (i.e. gap 2). As this pertains to collective action among business network partners, accordingly, we turn our attention to a review of the literature on organizational collective action so as to construct a theoretical lens that serves as *"a complicated sensing device to register a complicated set of events"* (Weick 2007, p. 16).

Theory: Organizational Collective Action

Organizational collective action refers to joint action undertaken by a group of organizations in pursuit of a collective goal (Chou et al. 2008; Okamoto 2003). Like environmental sustainability, the research on organizational collective action has a long and storied history that spans decades (e.g. Gray 1985), and is closely associated with the topics of inter-organizational relationships (Ring and van de Ven 1994), strategic alliances (Luo 2008), and cooperative strategies (Dyer and Singh 1998). It is primarily motivated as the means to solving what is termed the *"collective action problem"* (Willer 2009, p. 23) within a group of organizations, which may be in the form of a joint venture, a network, a consortia, an alliance, a trade association or an interlocking directorate (Barringer and Harrison 2006).

More specifically, the collective action problem at the organizational level stems from the public goods nature of the benefits of participating in a collective of organizations (Marwell and Oliver 1993). Organizations are motivated to participate in collective activities because they anticipate synergies from pooling their resources (Hargrave and van de Ven 2006; Zeng and Chen 2003). However, as the benefits of participating in a collective of organizations tend to be characterized by the (1) *impossibility of exclusion*; defined as the inability to exclude members of the collective from enjoying the benefits of membership even if they do not contribute to it, and the (2) *jointness of supply;* where one member's enjoyment of the benefits do not diminish the level of benefits to other members (Monge et al. 1998), *"free-riding"* (Albanese and van Fleet 1985, p. 244) or the inclination to contribute as little as possible, is a significant problem (Zeng and Chen 2003). As such, investigating how effective collective action can be achieved in spite of the potential for free-riding has been the dominant theme of studies on organizational collective action since the inception of the research stream (e.g. Olson 1965).

The accumulated body of research on organizational collective action is dominated by four theoretical perspectives, with each perspective advocating a different set of enablers of effective collective action (For a review, see Palmatier et al. 2007). The first is the commitment-trust perspective that suggests constructs related to commitment and trust, as opposed to control or interdependence, as the primary means of achieving effective collective action as they facilitate the formation of strong relationships between trusted stakeholders (e.g. Gulati and Nickerson 2008; Hardy et al. 2003). The second is the dependence perspective, which emphasizes the primacy of constructs related to mutual dependencies in inducing effective collective action as dependent partners work to maintain good relations and avoid antagonistic or destructive actions (e.g. Hibbard et al. 2001; Jap and Anderson 2007). The third is the transaction cost economics perspective, which suggests that effective collective action is the result of appropriate governance structures that account for relationship-specific investments and curb opportunistic behaviors (e.g. Hoetker and Mellewigt 2009; Lui et al. 2009). Finally, the fourth is the relational norms perspective, which proposes that effective collective action is a result of strong relational norms that enhance the organizations' abilities to develop deep and lasting relationships that are difficult to replicate (e.g. Luo 2008; von Hippel and von Krogh 2003). All of these enablers of effective organizational collective action in turn, are established, developed and governed by an overarching leadership structure that is appropriate to the particular collective (Gray 1985; Hargrave and van de Ven 2006). A non-exhaustive list

of the proposed enablers of effective organizational collective action from the four theoretical perspectives is presented in Table 1.

Table 1: Proposed Enablers of Effective Organizational Collective Action

Perspective	Enablers
Commitment-Trust	• Commitment (Palmatier et al. 2007) • Involvement (Hardy et al. 2003) • Dyadic-generalized/ fragile-resilient trust (de Wever et al. 2005) • Trust (Gulati and Nickerson 2008; Jap and Anderson 2007; Monge et al. 1998; Palmatier et al. 2007) • External confidence (Monge et al. 1998) • Accountability (Dyer et al. 2001)
Dependence	• Interdependence/ relationship dependence/ joint dependence (Gulati and Sytch 2007; Hibbard et al. 2001; Jap and Anderson 2007; Palmatier et al. 2007) • Dependence asymmetry (Gulati and Sytch 2007; Palmatier et al. 2007) • Functional/requirements overlap (Arya and Lin 2007) • Goal congruence (Jap and Anderson 2007)
Transaction cost economics	• Relationship specific investments/assets (Dyer and Singh 1998; Palmatier et al. 2007) • Opportunistic behavior/ greed (Hoetker and Mellewigt 2009; Lui et al. 2009; Palmatier et al. 2007; Zeng and Chen 2003) • Quality/ quantity of information (Monge et al. 1998) • Effective governance/ mode of governance (Gulati and Nickerson 2008; Rodriguez et al. 2007) • Member satisfaction with process (Monge et al. 1998) • Payoff (Zeng and Chen 2003)
Relational norms	• Relational norms (Palmatier et al. 2007; Zeng and Chen 2003) • Embeddedness (Gulati and Sytch 2007; Hardy et al. 2003) • Collective identity (Zeng and Chen 2003) • Procedural justice (Luo 2008) • Information exchange/ Knowledge sharing norms (Dyer and Singh 1998; Jap and Anderson 2007; von Hippel and von Krogh 2003) • Reciprocity (von Hippel and von Krogh 2003; Zeng and Chen 2003) • Status/ status difference (Arya and Lin 2007) • Relationship harmony (Jap and Anderson 2007)

In addition to the factor-oriented studies aimed at the identification and validation of these enablers, a number of other studies have examined organizational collective action from a process-oriented perspective as well. One study, for instance, suggests that the process of attaining effective organizational collective action consists of the sequential phases of problem setting, direction setting and structuring with each of these phases facilitated by a number of conditions (For a review, see Gray 1985). Another study suggests that the attainment of effective organizational collective action is a cyclical process that consists of the stages of negotiation, commitment and execution that is supported by an activity of continuous assessment that is carried out across the three phases (For a review, see Ring and van de Ven 1994). A third study from a different perspective (i.e. examining how collective action leads to institutional change) proposes 4 distinct processes that facilitate the attainment of effective organizational collective action: Framing contests, construction of networks, enactment of institutional arrangements and collective action processes (For a review, see Hargrave and van de Ven 2006).

Applying the literature on organizational collective action to analyze the events that transpired as part of China Mobile's green IT initiative, a process model depicting how green leadership is attained and enacted is inductively derived to address the research question set forth at the beginning of the paper.

Research Method

The case research method is particularly appropriate for this study for a number of reasons. First, case research is particularly useful for examining processes (Gephart 2004; Orlikowski and Baroudi 1991) and our study seeks to understand the processes of attaining and enacting green leadership for effective green IT implementation. Second, as green IT, environmental sustainability and collective action are all complex, multi-faceted phenomena that are inextricable from their organizational context (Pan et al. 2007; Pentland 1999), an objective approach to research may be difficult, making it more appropriate to examine the phenomenon by interpreting the shared understanding of the relevant stakeholders (Klein and Myers 1999).

Based on our research question, two criteria form the basis of case selection. First, the selected organization must have attained green leadership within a collective of organizations (i.e. the organization must have led associate organizations in the implementation of green IT initiatives). Second, the green IT initiatives of the collective must have achieved a significant measure of success as a result of the enactment of green leadership. The case of China Mobile, the largest mobile telecommunications provider in the world, is particularly appropriate for our purpose because not only did China Mobile lead the suppliers and customers within its business network in the implementation of a *"Green Action Plan"* (China Mobile 2010b, p. 36), but did so to great effect as well; reducing the carbon emissions of its business units and participating partners by 49% within a three year time span (China Mobile 2010a).

Research access was negotiated in November 2010 and interviews were conducted with a total of 16 unique informants within a span of 3 months. The informants consist of the key members of the green IT management and strategic planning team, managers and IT specialists of various business and geographical units, as well as a number of suppliers and customers from China Mobile's extensive business network that had participated in its *Green Action Plan* (refer to Table 2). A mirroring technique (Myers and Newman 2007) was used in our interviews to elicit each informant's account in their own language. This entails getting informants to explain the daily aspects of their work before inviting them to provide an account of the events that have unfolded. To ensure that the data was aligned with our topic of interest, informants were not only invited to give an account of what they thought were the critical events, activities and decisions that unfolded during the implementation of China Mobile's green IT initiatives, but they were encouraged to focus on aspects related to the organization's interactions with its network partners and its leadership of the collective initiative as well. Each interview took an average of 90 minutes, was digitally recorded, and later transcribed for data analysis.

Table 2: Profile of Interviewees

China Mobile Headquarters	
1.	Vice President, Department of Planning
2.	Director, Department of Planning
3.	Deputy Director, Access Network Planning Division
4.	Head, Green Action Plan Working Group
5.	Project Manager, Green Action Plan Working Group
6.	Manager (Strategic Planning), Green Action Plan Working Group
7.	Senior Executive, Green Action Plan Working Group
China Mobile Business Units	
8.	Data Manager, Home and Corporate Products Center
9.	Manager, Department of Data Services
10.	Project Manager, Operations and Network Support Department
11.	Manager, Sales Plan Department
12.	Head, Green Action Plan Working Group (Beijing Subsidiary)
13.	Manager, Facilities Department
Business Partners	
14.	Chief Engineer, China Construction Software Research Center
15.	Engineer, China Construction Software Research Center
16.	Project Manager, Beijing Building Energy Consumption

The interview questions were tailored to the role of the informant and were designed to be open-ended and exploratory in nature. Each question was non-leading, and at the same time non-passive to maintain a critical balance between spontaneity and control over the interview (Walsham 1995). To allay any fear of speaking due to the presence of a recorder, each informant was assured of their anonymity and the confidentiality of the data provided, especially when potentially sensitive information is sought (Myers and Newman 2007; Walsham 2006). While the interviews formed our primary source of data (Walsham 2006), the interview data were supplemented by newspaper articles, internal publications (e.g. China Mobile 2010a, 2010b, 2011), information from the corporate website, corporate presentations, and over 80 photos and 65 minutes of video recordings. Notes from direct observation were also used to corroborate the data obtained.

Data analysis was performed in tandem with data collection to take full advantage of the flexibility that the case research method affords (Eisenhardt 1989). Based on our review of the literature on organizational collective action, we identified an initial set of themes (i.e. enablers and phases of effective organizational collective action) that were potentially relevant to the attainment and enactment of green

leadership. The set of themes formed the basis of our theoretical lens, which served as a "sensitizing device"(Klein and Myers 1999, p. 75) to guide subsequent data collection and analysis (Eisenhardt and Graebner 2007). The data from each interview were then organized and coded according to the set of themes (e.g. refer to Tables 3, 5, 6, 8) and the theoretical lens was modified incrementally whenever new evidence that challenged the existing schema emerged (Walsham 2006). In addition, a systematic verification procedure was established to ensure that each finding was supported by at least two sources of data (Klein and Myers 1999).

Data analysis was carried out by recursively iterating between the empirical data, the theoretical lens, relevant literature and the emerging process model (Eisenhardt 1989). A combination of a temporal bracketing strategy, a visual mapping strategy and a narrative strategy (Langley 1999) was first used to organize the empirical data. From the emergent data, we noticed three distinct phases with different activities and objectives in the process of attaining and enacting green leadership. Accordingly, the events, activities and decisions that transpired at China Mobile were divided into the three phases to facilitate the examination of how effective organizational collective action was achieved in the implementation of its green IT initiatives. In addition, several visual maps that summarized our interpretation of what happened and a detailed narrative were created to condense the voluminous amount of data into a more manageable form. Next, the visual maps and the narrative were compared with the relevant literature and our theoretical lens to shape our emerging theoretical ideas (Tan et al. 2010). These ideas were then captured in various diagrammatic sketches and these sketches, together with the visual maps and the narrative were verified with our informants to validate our interpretation of the data and the emerging process model. This process continued until the state of theoretical saturation was reached; where it was possible to comprehensively explain the findings of the case study and no additional data can be collected or added to improve the developed model (Eisenhardt 1989).

Case Description

Organization and Project Background

China Mobile was incorporated on April 20, 2000 and is currently the world's largest mobile telecommunications provider in terms of network size, number of customers and market value. Listed on both the Hong Kong and New York stock exchanges, China Mobile currently holds assets in excess of US$135 billion and ranks 77th in the Fortune Global 500 list (Fortune Magazine 2010). With the State-Owned Asset Supervision and Administration Commission (SASAC) of the Chinese Government as its largest shareholder, China Mobile has established an extensive network of subsidiaries in 31 provinces, autonomous regions, and directly-administered municipalities across China and currently commands a 70.6% market share in the domestic telecommunications market. It has an estimated 150,000 employees and serves a customer base of over 600 million worldwide.

China Mobile's environmental sustainability initiative was formalized as one of five major programs of a new Social Responsibility (CSR) Strategy launched in 2006. Dubbed the *"Green Program",* the initiative was triggered by the 11th five-year plan of China's Ministry of Environmental Protection, which aimed to reduce the energy consumption per GDP unit by 20% and the emission of major pollutants by 10% across all businesses in China within 5 years. The SASAC's response to the plan was to set the objective of reducing carbon emissions by 40% for all of the organizations under its umbrella. The result was the launch of the *Green Action Plan* in 2007 that advocated the adoption of an extensive array of information technologies (e.g. IP technology for networking, intelligent energy consumption monitoring systems, low-carbon alternatives for IT hardware, e-billing and electronic point of sales systems, etc.) for the purpose of energy conservation, reducing carbon emissions, increasing materials efficiency and reducing waste.

Nearly four years on, China Mobile's *Green Action Plan* is proving to be an unmitigated success beyond all initial expectations. By 2009, China Mobile had already achieved a 14% reduction in energy consumption and a 49% reduction in carbon emissions across all of its business units, well exceeding the targets set by the SASAC nearly a year before its deadline. Today, China Mobile is an important member of the United Nations Global Compact's Caring for Climate Program and the first and only mainland Chinese corporation to be recognized on the Dow Jones Sustainability Index. But what is most significant about China Mobile's achievements is that it has not only met its environmental objectives, but achieved significant cost savings; by enhancing its logistics, materials management and work processes (e.g. Yang

et al. 2009), and reputational benefits as well (e.g. the organization was also awarded the title of *"China's Top Ten Businesses in Energy Conservation"* from the China Energy Conservation Association in 2010) – achieving what has been termed as the triple bottom line (Porter and Kramer 2006, p. 82).

Much of its success has been attributed to the way China Mobile marshaled the collective resources and energies of the major suppliers and customers within its business network towards its environmental aims (China Mobile 2010a, 2010b). This process of attaining and enacting green leadership in turn, unfolded in three distinct phases.

Establishing a Green Vision (2007-2008)

Like most profit-oriented firms, prior to its efforts at establishing a concerted environmental protection program, China's Mobile's emphasis was on economic, as opposed to environmental, objectives. Consequently, when the decision was made that environmental objectives had to be formally included in its corporate strategy in response to the objectives set by the Chinese government and the SASAC, the senior management of China Mobile realized that the first thing they had to do is to establish a green vision – an awareness and a vision for environmental protection that is shared throughout the organization.

To this end, China Mobile first established a *Green Action Plan* working group and tasked the team with the responsibility of engaging the key business and provincial units under its corporate umbrella to develop a blueprint for meeting the objectives set by the SASAC. The working group then set about its task by first identifying a number of issues; including establishing organizational environmental standards, implementing energy-saving technologies, pursuing materials efficiency, nurturing a green organizational culture and creating an environmentally-friendly workplace (China Mobile 2010b), as well as the internal stakeholders that would be responsible for implementing and managing the change associated with these issues. This was followed by extensive discussions between the working group and the relevant stakeholders as the identified issues were clarified, and detailed action plans were developed and iteratively refined for each business or provincial unit. The overall result of these actions was the development of a detailed organizational environmental strategy that delineated a number of critical environmental priorities, complementing the economic objectives of its original corporate strategy. The existing situation prior to the establishment of the green vision, the activities undertaken to this end and the implications of those activities are summarized in Table 3.

Table 3: Establishing a Green Vision

Existing Situation	
Emphasis on economic objectives	*"For us in strategic planning, our (previous) emphasis was on investments, income, costs and how to do more with less. Energy conservation was a factor but it was just a secondary concern. In other words, we were more focused on our priorities, but its 'nice' if we can conserve energy on the side"* – Project Manager, Operations and Network Support Department
Activities Undertaken	
Formation of the *Green Action Plan* working group	*"In response to the strategic plans of the Government and the SASAC, the organization decided that we would follow suit… The Green Action Plan working group was set up as a crucial link in a 'tower of strength'. Directions come from the top but have to trickle down to the bottom, and the working group would be the conduit that facilitates concrete actions at the operational level"* – Manager (Strategic Planning), Green Action Plan Working Group
Identification of issues and responsible stakeholders	*"We identified issues (and the business units responsible for them) in a number of areas, including primary (e.g. network infrastructure) and supporting (e.g. office building) facilities management. We also identified a number of issues related to our operations… in areas related to recycling, waste management, and information related to energy conservation"* - Senior Executive, Green Action Plan Working Group
Consultative approach to establish strategic coherence	*"The working group will consult each and every business unit to hammer out a concrete plan of action. They will tell us what they hope to achieve and we will let them know if their suggestions are in line with our department's needs. The first priority is in meeting the fundamental needs of the business units. After that, they might have further suggestions on how we could improve and we would work together to refine those ideas. The key is to ensure that even after implementing these (environmental) objectives, we do not compromise on the needs of our customers and internal stakeholders."* – Data Manager, Home and Corporate Products Center
Implications of Activities	
Balance between economic and environmental objectives	*"There were many new initiatives as a result of the Green Action Plan… but we approached them from the angle of cost reduction; we approached them from the angle of increasing efficiency; we incorporated many (monetary) considerations and executed them as a single strategy"* - Manager (Strategic Planning), Green Action Plan Working Group

Enacting Internally, Promoting Externally (2008-2009)

With a detailed organizational environmental strategy in place, China Mobile, with the *Green Action Plan* working group as its executive arm, began pursuing two distinct initiatives. The first initiative was centered on executing the environmental strategy with the internal implementation of green IT initiatives within China Mobile. Prior to the development of the organizational environmental strategy, environmental awareness and responsibility were often manifested in initiatives that were efficiency-oriented (e.g. using fewer resources to reduce wastage). While these initiatives do contribute to environmental protection, the management of China Mobile realized that the organization as a whole has to do more if it was to have the intended deep and far-reaching impact on the environment.

To this end, the *Green Action Plan* working group first sought to induce changes in the culture, corporate values and norms of the organization with extensive awareness and promotional campaigns so as to create an environment that was conducive to the implementation of green IT initiatives. Following this, the working group then established Key Performance Indicators (KPIs) for the key areas identified in organizational environmental strategy. The challenges for the working group in this task were to manage the dialectic tension between effect and attainability, as well as to assign responsibility for meeting the relevant KPIs to the most appropriate internal stakeholder. The KPIs were then presented to the relevant stakeholders and iteratively refined with their inputs. The set of KPIs was an important instrument in formalizing an agreement and gaining the buy-in of the senior managers of the various business units. Overall, these actions helped to re-orientate the business units towards more strategic and effectiveness-oriented environmental initiatives to complement their initial emphasis on efficiency. Some of the effectiveness-oriented green IT initiatives implemented in this phase include the use of IP technology in their telecommunication networks, the installation of IT-based intelligent ventilation, cooling, and power control systems, as well as the use of environmentally-friendly materials in the construction and packaging of their hardware, network and communication devices (refer to Table 4). Table 5 provides a summary of the existing situation prior to the internal implementation of green IT initiatives, the activities undertaken to facilitate this initiative and the implications of those activities.

Table 4: Effectiveness-Oriented Green IT initiatives at China Mobile

Initiative	Description
IP-based Network	An energy saving communications network based on IP technology was developed and institutionalized across the entire organization. The initiative created savings of a total physical area of 50,500 square meters and 1.45 billion kWh of electricity (China Mobile 2010b, p. 37)
Intelligent ventilation and heat transfer systems	Natural means of ventilation and cooling (for equipment) were adopted at many business units across China Mobile. These means were controlled by IT-based intelligent ventilation and heat transfer systems. Through the adoption of these means, China Mobile was able to reduce the energy consumption for ventilation and cooling at their business units by 20-80% (China Mobile 2010b, p. 38)
Green Packaging	The Green Packaging project seeks to increase the reuse of materials and to reduce the materials needed for hardware, network and communication devices packaging without compromising the protection required for fragile equipment. As a result of this project, the use of wooden materials in packaging has been complete eliminated. This project was awarded the Worldstar Packaging Design Award (the most prestigious award in the global packaging industry) in 2009 (China Mobile 2010a).

As in the case of the first, the second initiative was driven by the realization that it will be difficult to attain the intended impact on the environment with China Mobile acting on its own. The management of China Mobile believed that the collective resources of the entities in their business network (including suppliers, customers and business partners) could be leveraged for economies of scale and synergistic outcomes. Consequently, the second initiative was centered on promoting its environmental ideals to these network partners so as to prime them for subsequent mobilization towards its environmental cause.

As most of their network partners were less environmentally conscious, like China Mobile before it embarked on its green program, their priorities were on profitability and their own self-interests. As such, China Mobile realized that to get their network partners to adopt its environmental ideals as their own, it would first have to induce a mindset change. To do this, China Mobile first attempted to align the goals of their network partners with its own. This was carried out by getting internal stakeholders who were interacting with the network partners to present the economic and environmental benefits of its green IT initiatives, and help them to establish green IT objectives of their own. Following this, China Mobile sought to establish formal incentive and enforcement mechanisms to ensure that its network partners

would work towards meeting those objectives. These mechanisms included environmental competitions, recognition for green IT exemplars, an energy conservation rating scale, and improvement targets tied to contractual renewals. With these mechanisms established, China Mobile would then secure the commitment of its network partners by establishing formal collaborative arrangements in the form of contracts or memorandums of understanding. The overall consequence of these actions was that China Mobile was able to influence many of its key network partners to incorporate collective environmental objectives into their corporate strategies. The existing situation prior to the promotion of its environmental ideals, the activities undertaken for this purpose and the implications of those activities are summarized in Table 6.

Table 5: Enacting Internally

Existing Situation	
Emphasis on efficiency as opposed to effectiveness	*"Our (previous) concept of Green (IT) was centered on efficiency… To us, green IT would be something like a video conferencing system. Before, when we have a meeting in Beijing, we would fly one or two representatives from our 31 provincial offices over. So with video conferencing, we would increase our efficiency greatly… in terms of reducing the amount of resources we used"* - Project Manager, Operations and Network Support
Activities Undertaken	
Inducing changes in culture, values and norms	*"To induce a cultural change, a mindset change within the organization… we launched programs like the 'Green Movement 199.' 199 means 'long-term' (in mandarin)… it was an internal campaign to promote awareness. We can't force people to turn off the lights, print in duplex, turn off all power sources and so on… but we can encourage and educate them… We also organized internal competitions for energy conservation, and competitions for the best energy saving ideas… We printed brochures and posters… set up booths with panel presentations… We sent reminder emails and text messages… We want to embed environmental consciousness in the daily lives of our employees."* - Manager (Strategic Planning), Green Action Plan Working Group
Establishing appropriate KPIs	*"We (the working group) created a comprehensive set of environmental KPIs based on the action plan and disseminated the KPIs that are relevant to the appropriate business units. The first thing a department manager will have to do is to verify if the KPIs are reasonable, and if they are relevant to his department because many of the KPIs are composite measures that could involve multiple business functions… It was an iterative process of negotiation and refinement…"* – Head, Green Action Plan Working Group (Beijing Subsidiary)
Gaining the commitment of senior business unit managers	*"After we have our KPI meeting with the Green Action Plan Working group from headquarters, we will hold a 'Green Action Plan Planning and Initiation Meeting' to develop a plan for meeting those objectives. The top managers and all the vice-presidents of our office are all involved in the planning process. The implementation of our green IT initiatives is initiated in this manner: in the most formal possible way"* - Head, Green Action Plan Working Group (Beijing Subsidiary)
Implications of Activities	
Achieving balance between efficiency and effectiveness	*"In our new direction… we are looking for long-term (as opposed to short-term) cost reductions. Our priority is achieving 'minimal cost, maximum effect'. We hope that with the use of green IT, we can reduce energy waste… but we take a more strategic view… We (now) feel that the Green Action Plan can (not only create efficiencies in isolated business processes, but) reduce the operating costs of the entire organization as a whole"* - Senior Executive, Green Action Plan Working Group

Acting in Concert (2009-Present)

The internal enactment of green IT initiatives provided China Mobile with invaluable implementation experience, demonstrable results, and the legitimacy to lead its network partners by example. The external promotion of its environmental ideals, on the other hand, created awareness, provided an indication of China Mobile's commitment to environmental protection, and primed its network partners for collaboration. With these facilitating factors clicking in place, China Mobile was now in the position to lead its network in the implementation of collective green IT initiatives.

Before the implementation of its green program, collective initiatives between China Mobile and its network partners were typically premised on control, governance, and the principle of *'give-and-take'*. However, the management of China Mobile was not satisfied with this *'control-and-react'* mode of collaboration as they believed it created a tendency for satisficing and minimal commitment among its network partners. Consequently, in the implementation of collective green IT initiatives, China Mobile sought to foster a symbiotic and mutually-reinforcing mode of collaboration based on equity and proactivity instead. To this end, China Mobile's first order of business was to create a sense of joint-ownership over the collective green IT initiatives by emphasizing to its network partners that their brand and reputation were at stake as well. In addition, China Mobile also provided their network partners with resources, infrastructure and training to develop their capabilities, which in turn, enhanced their abilities

to participate and contribute to the collective cause. Following this, China Mobile would also encourage their partners to exercise their enhanced capabilities by engaging them in joint innovations in the production of collective green IT initiatives. Overall, these actions promoted self-organization and voluntarism that enabled China Mobile to adopt a coordinating role and only intervene when necessary. More importantly, these factors enabled the implementation of collective green IT initiatives on a variety of fronts, allowing China Mobile to take a significant step towards achieving the deep and far-reaching environmental impact that it had hoped to achieve. Some of the collective green IT initiatives undertaken in this phase include a server virtualization research project, a city-level building energy consumption monitoring project, the establishment of industry energy conservation standards, and the organization of a *Green Action Plan* industrial cooperation forum (refer to Table 7). Table 8 provides a summary of the existing situation prior to the implementation of collective green IT initiatives, the activities undertaken to facilitate this purpose and the implications of those activities.

Table 6: Promoting Externally

Existing Situation	
Emphasis of network entities was on self-interest	*"(Previously,) if we wanted our business partners' cooperation in solving 'Green' issues, we had to provide them with the solution… The solution would have to be attractive to them and aligned with their interests before they would accept the idea. So when we propose the solution, we would have to provide them with a lot of quantitative statistics to demonstrate this (alignment with partners' interests)"* – Senior Executive, Green Action Plan Working Group
Activities Undertaken	
Aligning the goals of network partners with their own	*"We tell our business partners our environmental goals and help them establish their own in alignment with ours… Over time, they have come to realize that these goals benefit them as well. They can tell their other customers that they have achieved China Mobile's environmental standards… this enhances them credibility"* - Head, Green Action Plan Working Group (Beijing Subsidiary)
Establish incentive and enforcement mechanisms	*"We would establish competitions to motivate our stakeholders. We have a 'Most Advanced Energy Conservator' award for four categories of stakeholders and the prize money is about RMB¥80,000… Partners who have achieved our highest environmental standards will be cited as model cases for others to emulate"* - Head, Green Action Plan Working Group (Beijing Subsidiary) *"We have formal contracts with environmental objectives that are renewable in 2 years and we will set them (network partners) targets for improvement. For example we would want them to improve by 10% or 20% (in terms of energy reduction)"* - Manager (Strategic Planning), Green Action Plan Working Group
Formalization of collaborative arrangement	*"In 2009, China Mobile signed 53 suppliers onto a strategic memorandum of understanding, making them official partners of its Green Action Plan"* (China Mobile 2010b, p. 36)
Implications of Activities	
Achieving a balance between self and collective interest among network entities	*"The balance between their (network entities') self-interest and the interest of everyone is key… For example, a supplier might implement a (green IT) initiative… If cost savings result, the cost savings will be split between the two parties. It benefits them because this increases their income… but it contributes towards the collective goal of environmental protection as well"* - Head, Green Action Plan Working Group (Beijing Subsidiary)

Table 7: Collective Inter-Organizational Green IT initiatives led by China Mobile

Initiative	Description
Server virtualization research project	This project was a joint venture with two business partners to research and create a form of server resource virtualization technology. This technology combined the various forms of virtualization technologies (such as server virtual partitioning, virtual storage, virtual resources, etc.) to provide automated on-demand scaling up and down of server resources based on consumption and needs. The technology has been tested to be able to reduce energy consumption by 42%, demand 40% less physical space, achieve cost savings of 15.9%, and an increase in IT infrastructure usage by more than twofold.
City-level building energy consumption monitoring project	A city-level building energy consumption monitoring system was developed in conjunction with the Beijing City Council. The system was a SMS-based system that monitored the energy consumption of all state-owned buildings in Beijing. The system provided insightful information that allowed building owners to benchmark their energy consumption with buildings of a similar class. The information served to alert the building owners to potential energy wastage and motivate them to participate in environmental initiatives.
Industry energy conservation standards	An energy conservation rating standard (with ratings of A, B, and C) was established for China Mobile's equipment suppliers. Enforced through a central IT-based procurement system, China Mobile established the rule that for large equipment tenders, only equipment rated at A or B for energy efficiency will be considered. To help its equipment suppliers improve their rating, China Mobile would also engage in joint technical research and development with them.

Table 8: Acting in Concert	
Existing Situation	
Collective action was directed and 'transaction-like'	*"Before we had the Green Action Plan, our collaboration (with network partners) were transaction-like. If they wanted to collaborate with us… they would say 'our products superior', 'our prices are lower', 'our quality is higher'… These are tangible parameters that formed the rules of engagement. We would then incentivize them and control them based on these tangible measures"* - Manager (Strategic Planning), Green Action Plan Working Group
Activities Undertaken	
Creating a sense of ownership for partners over collective activities	*"We try to make our partners realize that this concerns their brand and reputation as well. This is an incentive for them to take ownership. We would drive some (green IT) projects, but sometimes, they would push us to work with them as well. So we don't have to resort to hard measures to coerce them to cooperate… they would take the initiative as well"* – Senior Executive, Green Action Plan Working Group
Facilitating the development of partner's capabilities	*"China Mobile helped us to develop the capabilities required for our own Green (IT) initiatives… For example, in an energy consumption monitoring project, we used meters that transmitted data wirelessly with GPRS but this was unreliable. China Mobile provided us with a GRE (*Generic Routing Encapsulation) *Tunnel as an alternative. This made data transmission reliable… This made the project work…"* - Chief Engineer, China Construction Software Research Center (China Mobile's Business Partner)
Joint innovation in the production of collective green IT initiatives	*"… in alliance with Huawei, Ericsson, Motorola, Nokia Siemen Networks, Alcatel-Lucent and 6 other leading equipment suppliers… China Mobile is (jointly engaging in the) research and development of (a mobile device) packaging solution…"* (China Mobile 2010a, p. 23) *"Many of our (green IT) initiatives today are joint innovations. We would engage in brainstorming exercises over months before deciding on what we would do… These brainstorming exercises would involve our manufacturers and business partners"* – Data Manager, Home and Corporate Products Center
Implications of Activities	
Achieving a balance between directed and voluntary collective action	*"With an understanding of what China Mobile is trying to do, our partners have become more proactive in collaboration. For example, we communicate with our suppliers more often now… once every fortnight, and through a variety of channels. Some of them genuinely care about our objectives and sometimes, they would initiate things voluntarily. Take, for example, a supplier like Huawei. They came to understand our Green Action Plan and they immediately launched a corresponding Energy Conservation and Emissions Reduction initiative helmed by a working group to work with us."* - Senior Executive, Green Action Plan Working group

Discussion

By integrating the different activities that were enacted by China Mobile across the three distinct phases, a process model of the attainment and enactment of green leadership (refer to Figure 1) can be inductively derived to address the research question set forth at the beginning of the paper. Overall, our model suggests that the process of attaining and enacting green leadership consists of four harmonizing sub processes (refer to Figure 2) that unfold in a particular sequence across three phases that for simplicity we term *'strategizing'*, *'mobilizing'* and *'collectivizing'* respectively. The four sub-processes, in turn, may be classified in a 2x2 matrix along the dimensions of actor location (i.e. whether the activities are enacted by internal or external stakeholders) and strategic focus (i.e. whether the activities are meant to stimulate motivation or behavior) that echoes the *"integrated sustainability framework"* of Dao et al. (2011, p. 69). Given that our model is inductively derived from the case data, the following stream of reporting provides an explanation of how the existing literature corroborates our model and how the model enriches the existing perspectives of collective action in green IT implementation (e.g. Elliott 2011).

Phase 1: Strategizing

Based on our case study, our process model suggests that the attainment and enactment of green leadership should begin with a sub-process of *'envisioning'* in the *strategizing* phase. *Envisioning* is an internal-motivational activity (Dao et al. 2011) aimed at establishing strategic coherence to re-orientate a firm that is about to implement green IT initiatives towards objectives related to sustainability, as opposed to profitability (Porter and Kramer 2006). At China Mobile, this sub-process was manifested in the development of a comprehensive organizational environmental strategy that defined a number of environmental priorities. The harmonization between profitability and sustainability was evident from the account of the Manager (Strategic Planning) of the *Green Action Plan* working group, who noted that monetary considerations were incorporated in the plan for China Mobile's green IT initiatives, and executed *"as a single strategy"* (refer to Table 3).

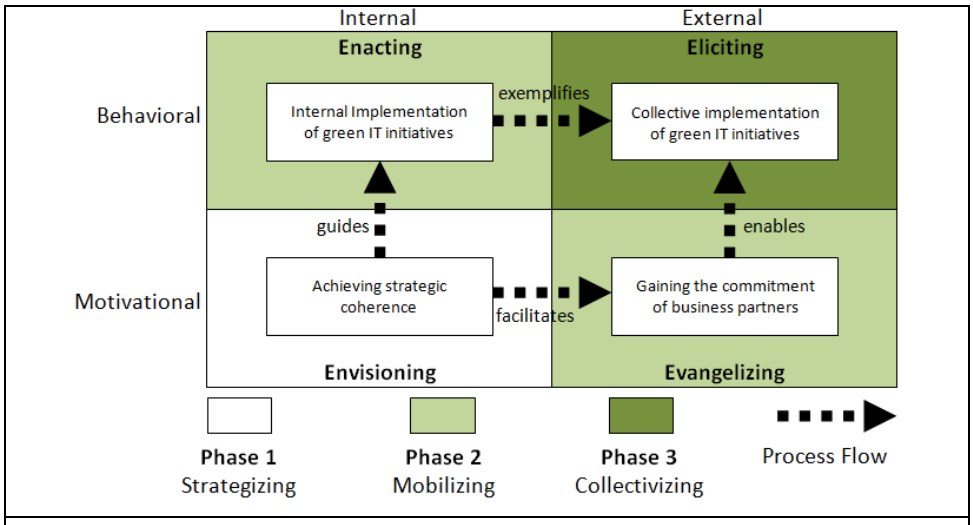

Figure 1: Process Model of the Attainment and Enactment of Green Leadership

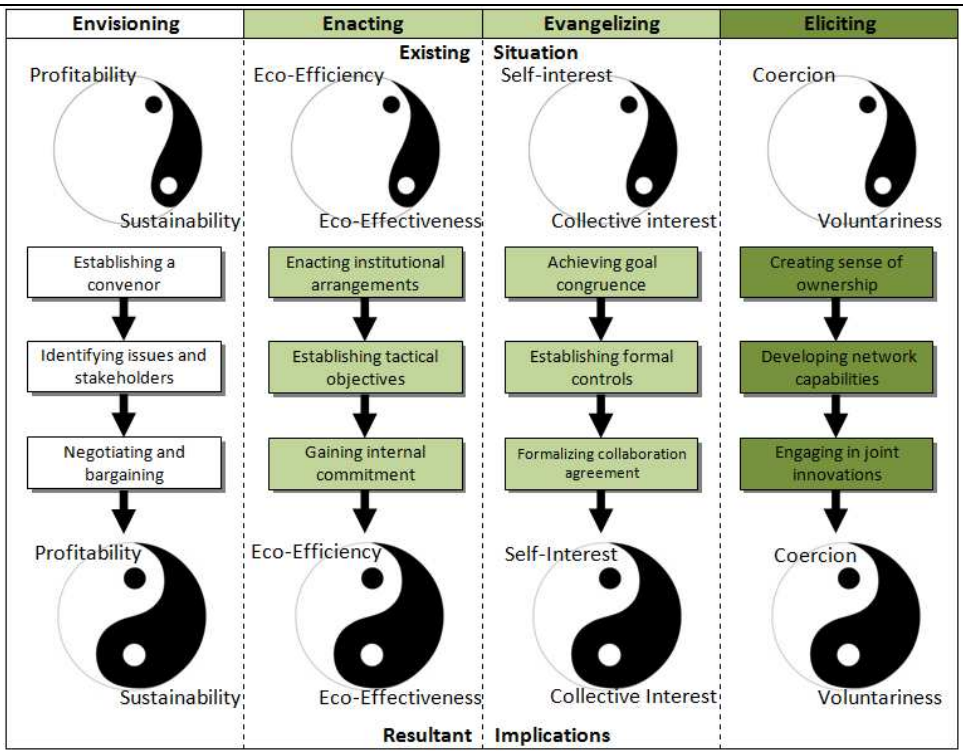

Figure 2: The Four Harmonizing Sub-Processes of Green Leadership

The importance of establishing strategic coherence early on is corroborated by the process models on organizational collective action, which all suggest that effective collective action begins with a phase related to planning and strategizing that have been variously termed *"problem-setting"* (Gray 1985, p. 918), *"negotiations"* (Ring and van de Ven 1994, p. 97), or *"framing contests"* (Hargrave and van de Ven 2006, p. 869). *Envisioning*, in turn, consists of three sequential activities: establishing a convenor, identifying issues and stakeholders, as well as negotiating and bargaining. The illustrative examples of

these activities from our case study, as well as the relevant excerpts from prior research that support the propositions of our process model are presented in Table 9.

Table 9: Activities of the Strategizing Phase

Activities	Illustrative Examples from Case Data*	Corroborating Arguments
	Envisioning	
Establishing a convener	Role of convenor was filled by the *Green Action Plan* working group that served as the "*conduit (for top management directives) that facilitates concrete actions at the operational level"*	The initiation of collective action requires a convenor that possesses *"legitimate authority and appreciative skills and who can serve as reticulists to rally other stakeholders to participate"* (Gray 1985, p. 924)
Identifying issues and stakeholders	The *Green Action Plan* working group identified a number of issues as well as the internal stakeholders that would be responsible for them.	Identification of stakeholders to manage a collective issue reduces problems associated with accountability in collaboration (Dyer et al. 2001).
Negotiating and bargaining	The *Green Action Plan* working group would *"consult each and every business unit to hammer out a concrete plan of action"*	Negotiating and bargaining facilitates the development of consensus, joint expectations (Ring and van de Ven 1994), and goal congruence (Jap and Anderson 2007)

*The illustrative examples used in this table are all taken from Table 3

Phase 2: Mobilizing

Following the sub-process of *envisioning*, our process model suggests that an organization with the motivation and ability to exercise green leadership should leverage the environmental strategy developed in the previous phase to launch the sub-processes of *'enacting'* and *'evangelizing'* in a subsequent *mobilizing* phase. *Enacting* is an internal-behavioral activity (Dao et al. 2011). It entails the implementation of green IT initiatives, possibly on a smaller scale, within the boundaries of the focal organization that aims at a balance between eco-efficiency and eco-effectiveness (see Watson et al. 2010). E*nvisioning* should precede and facilitate *enacting* because the environmental strategy and/or action plan developed in the previous phase would guide the implementation of green IT in the present phase (Jenkin et al. 2011). In our case study, *enacting* was manifested in the implementation of a number of internal green IT initiatives that are not only aimed at reducing the consumption of resources (i.e. eco-efficiency), but at *"doing the right things"* towards providing an *"ultimate solution for ecological problems"* (Watson et al. 2011, p. 28) as well.

Conversely, *evangelizing* is an external-motivational activity (Dao et al. 2011) that involves promoting the environmental ideals of the focal organization to its business partners with the aim of imposing structures that motivate them to strike a balance between their self-interests and the collective interests of the business network (Melville 2010). Once again, *evangelizing* is facilitated by the preceding sub-process of *envisioning* as a coherent environmental strategy makes it easier to communicate and promote the focal organization's environmental ideals to external stakeholders (Elliott 2011). At China Mobile, *evangelizing* was manifested in its efforts at inducing a mindset change among its business partners to encourage a *"balance between their (business partners') self-interest and the interest of everyone"* (refer to Table 6).

Enacting green IT initiatives internally prior to the mobilization of network partners for the collective implementation of green IT initiatives is important as it is a means for establishing procedural fairness (Luo 2008) and confers the focal organization with the legitimacy to lead (Dacin et al. 2007). In addition, the importance of *evangelizing* after an initial phase of strategizing is supported by the existing process models on organizational collective action, which suggest that following an initial phase of planning and strategizing, there is a need to establish a *"coincidence of values"* (Gray 1985, p. 926) and securing *"commitments for future action"* (Ring and van de Ven 1994, p. 97). Both *enacting and evangelizing*, in turn, consists of three sequential activities. These activities include enacting institutional arrangements, establishing tactical objectives and gaining internal commitment, as well as achieving goal congruence, establishing formal controls and formalizing collaboration agreement respectively. Table 10 presents the illustrative examples of these activities from our case study and the propositions from the existing literature that corroborates our argument.

Phase 3: Collectivizing

Finally, our process model suggests that the process of attaining and enacting green leadership should culminate with a sub-process of *'eliciting'* in a collectivizing phase. *Eliciting* is an external-behavioral

activity (Dao et al. 2011) centered on the collective implementation of green IT initiatives that are not mandated by the focal organization seeking to exercise green leadership, but are instead autonomously and voluntarily initiated by its network partners (Hardy et al. 2003). In our case study, this sub-process was manifested in China Mobile's efforts at fostering a symbiotic and mutually-reinforcing mode of collaboration that emphasizes proactivity and equity among its network partners.

Table 10: Activities of the Mobilizing Phase

Activities	Illustrative Examples from Case Data*	Corroborating Arguments
Enacting		
Enacting institutional arrangements	Internal campaigns, competitions, and promotional campaigns via brochures, presentations, emails and text messages were conducted to induce changes in the culture, values and norms of the organization.	Institutional arrangements refer to the contextual forces that are conducive to institutional change. They are enacted prior to change to facilitate the process of change (Hargrave and van de Ven 2006).
Establishing tactical objectives	Tactical objectives in the form of *"KPIs that are relevant to the appropriate business units"* were established and disseminated to internal stakeholders	Clear and agreed collective objectives facilitate clarity, as well as performance measurement and management, which are critical in collective action (Winkler 2006).
Gaining internal commitment	Meeting with the senior managers of the business units were held to communicate the KPIs and obtain their commitment	Perceived importance of green IT affects internal resource commitments, which in turn, influences the economic and environmental consequences of green IT initiatives (Mithas et al. 2010).
Evangelizing		
Achieving goal congruence	China Mobile presented its environmental objectives to its business partners and explained how they can bring about other benefits like enhanced credibility	If partnering firms cannot establish goal congruence, *"their relationship will never move beyond proclamations"* (Jap and Anderson 2007, p. 262)
Establishing formal controls	A system of incentives and enforcement measures were established to encourage or ensure compliance with its environmental objectives.	A governance structure consisting of formal controls may be necessary to initiate collective action, particularly in the absence of a prior history of voluntary collaboration (Rodriguez et al. 2007)
Formalizing collaboration agreement	A formal memorandum of understanding were signed with 53 major suppliers to make them official partners of China Mobile's *Green Action Plan*	Formal contracts can used to ensure commitment to collective objectives (Ring and van de Ven 1994).

*The illustrative examples used in this table are all taken from Tables 5 and 6

Striking a balance between voluntariness and coercion in the collective implementation of green IT initiatives is particularly important for two reasons. First, voluntarism is a manifestation of involvement and embeddedness (Gulati and Sytch 2007; Hardy et al. 2003), which ensures that network partners are highly motivated and committed to contributing towards the collective cause (Das and Teng 2001). On the other hand, coercive mechanisms in the form of formal controls can aid in the governance of a diverse network to ensure that the resources and efforts of network members remain directed and focused on collective goals (Kirsch 2004). *Eliciting*, in turn, consists of three sequential activities: creating a sense of ownership, developing network capabilities, and engaging in joint innovations. The illustrative examples of these activities from our case study, as well as the relevant propositions from the existing literature that corroborate our arguments are presented in Table 11.

Table 11: Activities of the Collectivizing Phase

Activities	Illustrative Examples from Case Data*	Corroborating Arguments
Eliciting		
Creating sense of ownership	Autonomy was granted by China Mobile to its business partners to take ownership and initiate independent green IT projects.	As partnering firms take ownership of collective goals and internalize them as their own, their motivation and commitment to achieve these goals will be high (Das and Teng 2001)
Developing network capabilities	China Mobile provided its partners with resources, infrastructure (e.g. GRE Tunnel) and training to enhance their capabilities to pursue green IT initiatives	Developing the capabilities of network members enables them to contribute more effectively to collective goals (Lengnick-Hall and Wolff 1999)
Engaging in joint innovations	Joint research and development agreements with major suppliers were established. Brainstorming exercises were conducted with its business partners in the development of joint green IT solutions.	Collaborative innovations builds culture of reciprocity (von Hippel and von Krogh 2003) that encourages contributions to collective causes (Zeng and Chen 2003).

*The illustrative examples used in this table are all taken from Table 8

Conclusion

Limitations and Future Research

This article is not without its limitations. Although studies based on the single case research method are a "typical and legitimate endeavor" (Lee and Baskerville 2003, p. 231) in qualitative research, a common criticism of the approach is the problem of generalizability (Walsham 2006). Although we readily acknowledge that statistical generalization is impossible from a single case study, we nevertheless contend that our study is generalizable beyond its singular context as our process model is not only grounded in the empirical reality of our case study, but is corroborated by the theoretical propositions of some of the most established works in the literatures on collective action and green IT. As such, this study invokes the principles of "analytic generalization" (Yin 2003, p. 32) or what Lee and Baskerville (Lee and Baskerville 2003, p. 235) refers to as *"generalizing from description to theory"*. Nevertheless, future research can be directed at statistically validating the propositions of this study, so that the boundary conditions of our process model can be better defined.

A second limitation is that the focus of our study is restricted to that of a core firm within a business network with the motivation and ability to exercise green leadership. However, a business network consists of other peripheral entities as well (see Pierce 2009; Teece 2007), and although their influence on the green IT initiatives of a business network may or may not be less direct, the collective and independent effects of their behaviors and actions should not be discounted. While it is certainly impossible to exhaustively account for the influence of all types of members within a single study, examining the effects of the behaviors and actions of these peripheral entities may certainly be a fruitful avenue for future inquiry, and will provide a more complete picture of how collective green IT initiatives may be effectively implemented.

Theoretical and Practical Implications

By addressing the research question set forth at the beginning of this paper, this study makes a number of important contributions. First, this study provides an empirically grounded framework that contributes towards addressing the lack of empirical studies in green IT research (Dao et al. 2011; Melville 2010). Second, by introducing the notion of green leadership and developing a theoretical model that traces the process of attaining and enacting green leadership in its entirety, this study not only makes a conceptual innovation but sheds light on one of the key mechanisms for achieving effective collective action in the implementation of green IT as well (Gray 1985; Hargrave and van de Ven 2006). The latter is a particularly important contribution given that collaboration and collective action among diverse stakeholders beyond the boundaries of a single organization can enhance the reach and magnitude of the impact of green IT implementation (Corbett 2010; Elliott 2011). In being one of the first external-oriented empirical studies on green IT, we hope that this study can provide a foundation for future studies aimed at validating, extending or establishing the boundary conditions of the propositions of this study, and serve as a catalyst for further research on the collective implementation of green IT initiatives. So that in reinforcing the existing studies that have examined the phenomenon from a more internal-oriented perspective (e.g. Chen et al. 2009; Mithas et al. 2010; Molla et al. 2009b), a more holistic picture of the phenomenon can emerge.

In addition, this study also makes two important contributions to the literature on organizational collective action. First, this study not only unifies a number of different process models of organizational collective action (e.g. Gray 1985; Hargrave and van de Ven 2006; Ring and van de Ven 1994) within a single framework, but it also structures many of the enablers of organizational collective action that have been identified in the literature in a step-by-step *"recipe that strings (the conditions) together in such a way as to tell the story of how (the outcome) occurs whenever it does occur"* (Mohr 1982, p. 37). Second, it has been noted that studies of the non-monetary outcomes of collective action are rare (Arya and Lin 2007; Todeva and Knoke 2005). As such, not only is this study is one of the first that is conducted in a unique context (i.e. green IT initiatives aimed at non-monetary outcomes but executed by for-profit firms), it also hints at the boundary conditions of prescriptions for organizational collective action that have been derived from a for-profit setting. For example, some enablers of organizational collective action such as relationship specific investments (e.g. Palmatier et al. 2007) and governance structures that curb

opportunistic behavior and greed (e.g. Hoetker and Mellewigt 2009; Lui et al. 2009; Zeng and Chen 2003) did not feature prominently in our case study and may potentially be less relevant for collective action targeted at non-monetary outcomes (Arya and Lin 2007).

In terms of implications for practice, this study is significant in that it provides a comprehensive and empirically supported framework for the attainment and enactment of green leadership. More specifically, the process model developed in this article has identified the crucial phases that an organization must go through, as well as the enablers and activities of each phase, if it wishes to implement green IT initiatives with significant and lasting impacts. In particular, it is hoped that organizations with the motivation and ability to exercise green leadership can use the process model developed in this article as a detailed roadmap to identify the appropriate actions and steps to undertake, so that they can leverage the collective resources and capabilities of their business network to contribute towards sustainability and preserving the environment for future generations.

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